

of descending projections from the frontal lobes and amygdala will not only prevent ventricular fibrillation following coronary artery constriction in psychologically-stressed animals, but it will also normalize blood-pressure elevations in several animal models of experimental hypertension. Thus, neurophysiological or electrocardiac abnormalities can be detected by PD2i analyses of the EEG or ECG in hypertensive patients.

EXAMPLE 8

The present invention can also be used to determine cognitive processes. It is known through event-related potential research that there are EEG correlates of

ischemia. Table 6 below shows that mean PD2i reduction during the first minute following complete left anterior descending coronary occlusion is indeed predictive of VF, but additionally that the PD2i reduction is monotonically reduced as a function of time following acute coronary artery occlusion, and that PD2i reduction is monotonically reduced as a function of the percent occlusion of the coronary artery. Thus, PD2i reduction is proportional to the degree of myocardial ischemia, both as it accumulates in time and as it is related to the degree of coronary artery constriction.

TABLE 6

Fig ID	Control* 0% Occ		Partial 50% Occ		Had VF	Severe 90% Occ		Had VF	Whole Epoch		Complete* 100% Occ		First Min #		Last Min #		Had VF
	Mean PD2i	SD PD2i	Mean PD2i	SD PD2i		Mean PD2i	SD PD2i		Mean PD2i	SD PD2i	Mean PD2i	SD PD2i	Mean PD2i	SD PD2i	Mean PD2i	SD PD2i	
1	3.9	0.84	2.9	0.95	no												yes
2	3.7	0.82	3.5	0.86	no	3.0	1.44	no									yes
3	1.6	0.87							1.2	1.10	1.22	0.30	1.08	0.13			yes
4	2.0	1.09							1.4	1.11	1.39	0.34	1.08	0.14			yes
5	2.7	0.65	2.3	1.14	no				1.7	1.11	1.60	0.77	0.93	0.22			yes
6	1.3	0.85	1.2	0.86	no				1.2	0.86	1.27	0.44	0.87	0.19			yes
7	3.3	0.69							1.8	1.22	2.43	1.36	1.39	0.22			yes
8	1.5	0.67															yes
Mean	2.5	0.81							1.4	1.08	1.58	0.64	1.07	0.18			

*Student's paired t-test, $t = 6.4$, $df > 100$, two-tailed alpha, $p < .01$

Student's paired t-test, $t = 7.6$, $df > 100$, two-tailed alpha, $p < .01$

*Replication of the 50% occlusion experiments for pigs 1 and 2 were: 2.5, 0.81, no; 3.2, 1.56, no.

intelligence, motor performance and perception. Since the PD2i of event-related potentials is more sensitive than the event-related potential itself to certain types of perception (e.g. the alteration of perception produced by the instructional set, demonstrated in Example 3, for expectancy of "weak" and "strong" sensory stimuli that are physically the same), the PD2i of other types of event-related MEG potentials, evoked in other stimulus paradigms, are more sensitive than the event-related potentials themselves to the underlying cognitive process.

EXAMPLE 9

Certain types of autonomic electrophysiological responses have been associated with lie detection. More recently the possession of secret knowledge has been revealed through analysis of event-related potential components (e.g. enhancement of the P3 component of a "target" stimulus). Because the PD2i of electrophysiological potentials regulated by both the central and autonomic nervous system has been shown to be more sensitive and specific in the detection of underlying pathology than any of a variety of stochastic analyses of the same data, it would be expected that the PD2i of electrophysiological potentials evoked in a paradigm to reveal secret knowledge would similarly be more sensitive and specific, and hence to enhance the lie-detection method.

EXAMPLE 10

In data from conscious pigs, not only did PD2i reduction show sensitivity to imminent risk of VF (as described in human patients in Example 1) but also to myocardial

Table 6 tabulates the effects of left anterior descending coronary artery occlusion of various degrees (100%, 90%, 50%) on the mean Point-D2 of RR intervals in the conscious pig. Each pig was stressed by the unfamiliar laboratory. The control data (8.3 min) were recorded immediately before complete coronary occlusion. During complete occlusion experiments, pigs 1, 2 and 8 showed short-latency ventricular fibrillation (VF latency: 1.0, 3.0, 1.2 min); this prevented sufficient data acquisition to calculate the PD2i. In the other pigs the VF latency was 7.0 to 11.7 minutes. After VF, the coronary occlusion was released and the heart electroconverted. Additional experiments were performed in some pigs, on separate days; both 50% and 90% occlusion experiments were performed (15 min in duration, no VF, pulsed-Doppler ultrasound assessment of coronary blood velocity).

After 24-hrs of recovery from the last experiment each pig was euthanized with pentobarbital and the excised heart examined for histochemical evidence of myocardial ischemia (HBFP stain) and coronary stenosis; no heart showed evidence of myocardial ischemia or any coronary anomalies, thus indicating normal myocardial conditions under which all experiments were performed.

The illustrated embodiments have proven to be useful in many applications for this art. Further modifications the disclosure will occur to persons skilled in the art. These modifications are within the scope and spirit of the present invention as defined by the following claims.

What is claimed is:

1. In combination in a system for detecting and predicting biological anomalies, comprising:

- (a) means for receiving electrophysiological signals;
- (b) means for amplifying and digitizing said electrophysiological signals; and